Venous thromboembolism: Risk profile and management of prophylaxis in gynaecological surgery patients

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Objectives. This study aims to describe the venous thromboembolism (VTE) risk profile of women undergoing elective gynaecological surgery in a tertiary hospital and to audit the VTE prophylaxis prescribed.
Methods. One hundred and nine women who underwent elective gynaecological surgery at Kalafong Provincial Tertiary Hospital were assessed in terms of their risk of developing perioperative VTE, using the modified Caprini VTE risk assessment model. An audit of the VTE prophylaxis they received was conducted postoperatively.
Results. Of the 109 women, 45% were classified as at very high risk for VTE, 38% as at high risk, 14% as at moderate risk and 3% as at low risk. The audit revealed that only 5% of patients received the correct VTE prophylaxis, 55% received inadequate prophylaxis and 40% received no prophylaxis.
Discussion. The majority of patients undergoing elective gynaecological surgery are either at high risk or very high risk for developing postoperative VTE-related morbidity. This group of patients require formal preoperative VTE risk assessment using a recognised scoring model. VTE prophylaxis should be administered according to recognised guidelines to avoid inadequate prophylaxis.

Venous thromboembolism (VTE) is a life-threatening condition. An estimated 33% of patients undergoing an elective general surgical procedure will suffer some form of VTE as a postoperative complication.[1] Autopsies show that approximately 10% of all in-hospital deaths are attributed to pulmonary embolism (PE).[2]

Clinical diagnosis of VTE is problematic, as the signs and symptoms of both PE and deep-vein thrombosis (DVT) have low sensitivity and are unreliable as the signs and symptoms are often nonspecific.[3] DVT is often clinically silent and its most feared consequence, PE, is often rapidly fatal.[2,4] Survival rates following PE are lower than previously indicated, with fewer than 60% of patients surviving a week after the acute event, and less than half still alive after 1 year.[4] Among the survivors, 1% suffer from chronic pulmonary hypertension and its sequelae.[4] DVT also poses considerable long-term morbidity in the form of post-thrombosis syndrome (29%) and recurrent DVT (30%) within the next 8 years.[5]

A clinical trial involving more than 16 000 high-risk surgical patients showed the necessity and efficacy of VTE prophylaxis. In this trial, VTE prophylaxis was shown to reduce the incidence of acute DVT by 66% and the mortality rate of PE by 50%.[6] These findings have been confirmed by a consensus panel of the American College of Chest Physicians (ACCP).[5] There are conclusive data that VTE prophylaxis is more effective in preventing death and more cost-effective than treating established disease.[6,7]

Despite evidence of the benefits of VTE prophylaxis, studies of clinical practices worldwide suggest that VTE prophylaxis is underutilised, and implementation of guidelines formulated by the ACCP is inconsistent and inadequate.[5,8] In an audit of 16 hospitals in Massachusetts, Anderson *et al.*[5] demonstrated that VTE prophylaxis was prescribed to only a third of patients at high risk for VTE. A study of more than 1 000 consecutive hospital admissions revealed the implementation of VTE prophylaxis to be as low as 35%.[4]

The ACCP guidelines are generally regarded as the standard of care in VTE prophylaxis.[8] Apart from the fact that VTE prophylaxis is generally poorly prescribed, it is also evident that the concept of VTE risk categories and the use of risk assessment models are not well implemented.[3]

It is estimated that approximately 14% of patients undergoing gynaecological surgery for benign indications and 38% of oncology patients develop perioperative VTE.[9] Pulmonary embolism accounts for 40% of all deaths following gynaecological surgery.[10] With regard to VTE prophylaxis in gynaecological surgery, the literature is much scantier, but it is likely to be as underutilised as in other disciplines.

In 2013, the Southern African Society of Thrombosis and Haemostasis[11] reviewed and revised guidelines for VTE prophylaxis in the South African (SA) setting. A thorough search of the literature reveals a lack of data on the VTE risk profile of local patients undergoing gynaecological surgery, and the clinical practice of VTE prophylaxis in gynaecological surgery in SA has not yet been studied.

Both Caprini's risk assessment model[4] and the SA guideline are founded on the ACCP guidelines and in practice obtain the same endpoint. The SA guideline relies on the identification of risk factors, together with the type of surgery planned, to classify the individual patient's risk, whereas Caprini devised a risk-scoring system in order to render the ACCP guidelines more user-friendly.

The aim of this study was to establish the VTE risk profile and investigate clinical practices in VTE prophylaxis in women undergoing gynaecological surgery at Kalafong Provincial Tertiary Hospital, a referral hospital situated in Atteridgeville, Pretoria. This hospital serves a mainly urban black population in which the VTE risk profile is unknown.

Methods

All women admitted for elective gynaecological surgery at Kalafong Hospital between 1 March and 31 October 2010 were included in

Table 1. Venous thromboembolism risk assessment model for surgical and medical patients*

Step 1. Risk factors associated with clinical setting

Score 1	Score 2	Score 3	Score 5
Minor surgery	Major surgery† Immobilising plaster cast Medical or surgical patient confined to bed >72 hours High CVP	Myocardial infarction Congestive heart failure Severe sepsis/infection	Elective major lower extremity arthroplasty Hip, pelvis or leg fracture Stroke Multiple trauma Acute spinal cord injury

Baseline risk factor score (if score = 5, go to step 4):

Step 2. Predisposing risk factors associated with patient (assign score 1 unless otherwise noted)

Clinical setting	Inherited (score 3)	Acquired (score 3)
Age 40 - 60 years Age >60 years (score 2) History DVT/PE (score 3) Pregnancy or postpartum (<1 month) Malignancy (score 2) Varicose veins Inflammatory bowel disease Obesity (>20% ideal body weight) Combined oral contraceptive/HRT	Factor V Leiden/ activated protein C resistance Antithrombin III deficiency Dysfibrinogenaemia Homocysteinaemia 20210A prothrombin mutation	Lupus anticoagulant Antiphospholipid antibodies Myeloproliferative disorders Disorders of plasminogen and plasmin activation Heparin thrombocytopenia Hyperviscosity syndromes Homocysteinaemia

Total additional predisposing risk factors associated with patient:

Step 3. Total risk factors (exposing + predisposing)

Step 4. Recommended prophylactic regimens

Low risk (score 1)	Moderate risk (score 2)	High risk (score 3 - 4)	Highest risk (score ≥5)
No specific measurements Early ambulation	LDUH 5 000 U 12- hourly, LMWH 40 mg pd, IPC and GCS Duration: until discharge	LDUH 5 000 U 8-hourly, LMWH 40 mg pd and IPC GCS‡ (+ LDUH or LMWH) Duration: 7 - 10 days	LMWH 40 mg pd, LDUH 5 000 U 8-hourly, oral anticoagulants, IPC and GCS‡ Duration: 2 - 4 weeks

CVP = central venous pressure; DVT = deep-vein thrombosis; PE = pulmonary embolism; HRT = hormone replacement therapy; LMWH = low-molecular-weight heparin; LDUH = low-dose unfractionated heparin; pd = per day; IPC = intermittent pneumatic compression; GCS = graduated compression stockings.

*Adapted from Caprini.[2]

†Surgery lasting longer than 45 minutes.

‡Combining GCS with other prophylactic methods may give better protection.

the study. They all underwent preoperative VTE risk assessment according to the modified Caprini risk assessment model. Pregnant patients, women currently on treatment for DVT or PE, or those on any form of anticoagulation treatment were excluded from the study.

During the 8-month period the same investigator completed risk factor data sheets to classify all women into four risk categories. Subsequently the prescribed prophylaxis regimen was audited. In order to be considered correctly treated, a patient had to have received the correct drug at the right dose and dosage interval and for the correct period of time.

The modified Caprini risk assessment score that was used is shown in Table 1, together with the recommended prophylaxis regimens as advocated by the ACCP guidelines[12,13] and the Southern African Society of Thrombosis and Haemostasis.[11]

Information regarding prescribing practices and attitudes towards VTE prophylaxis

was obtained from treating doctors who completed a questionnaire at the end of the study.

Results

One hundred and nine patients scheduled for elective gynaecological surgery during the 8-month study period were included in the study. Their demographics are summarised in Table 2. The mean Caprini risk assessment score obtained is 5, which correlates with the highest-risk category.

Table 2. Demographic data and risk factor score of study population (*N*=109)

	Minimum	Maximum	Mean (SD)
Total risk factor score	1	18	5.04 (3.12)
Age (years)	22	82	44.28 (12.52)
Weight (kg)	39	110	75.08 (11.97)
Height (m)	1.5	2.0	1.66 (0.062)
BMI (kg/m²)	17.57	42.06	27.27 (4.42)

SD = standard deviation; BMI = body mass index.

Fig. 1 is a schematic representation of the VTE risk score distribution as obtained by Caprini's risk assessment model. Ten per cent of patients were smokers and were appropriately scored for that risk factor.

The surgical procedures performed on the patients in the study are depicted in Fig. 2.

The most commonly occurring risk factor for excessive bleeding was found to be non-steroidal anti-inflammatory drug (NSAID) use (*n*=18; 16.5%). Two patients (1.8%) were using low-dose aspirin, one (0.9%)
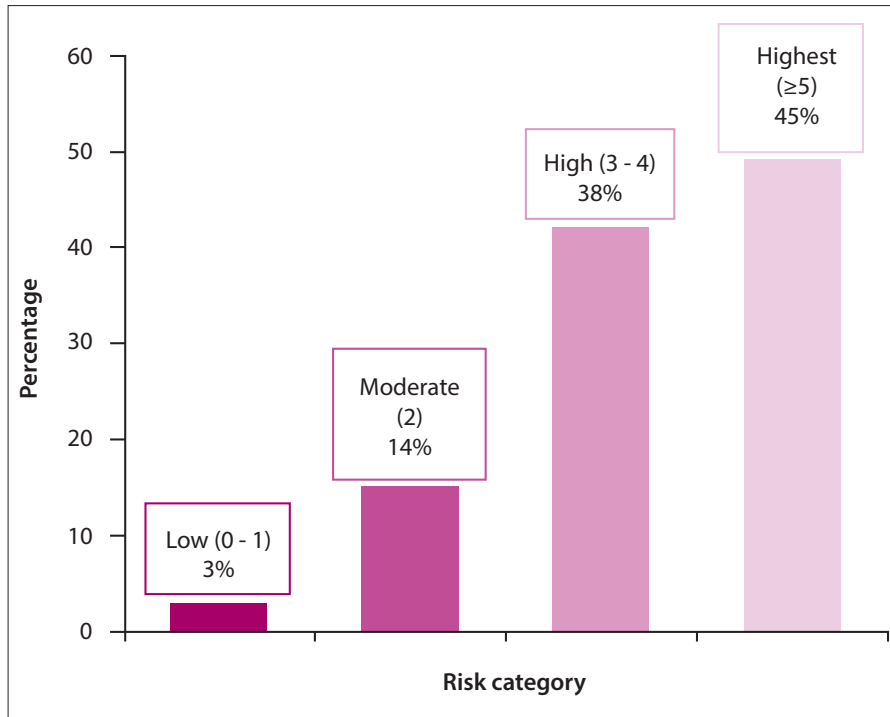
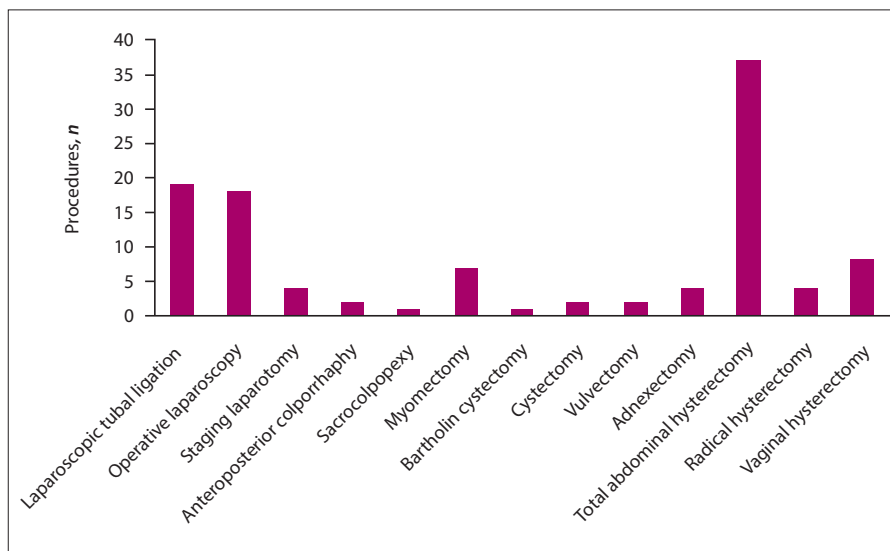Fig. 1. VTE risk score distribution. (VTE = venous thromboembolism.)

Fig. 2. Surgical procedures.

reported excessive bleeding from gums, nose or cuts, two (1.8%) had excessive menstrual bleeding and one (0.9%) gave a history of excessive bleeding during previous surgery.

The most commonly occurring risk factor for coagulopathy was the use of oral contraceptives (*n*=27, 24.8%). This was followed by varicose veins (*n*=9, 8.3%), swollen legs (*n*=8, 7.3%) and hormone replacement therapy (*n*=7, 6.4%). One patient (0.9%) had a history of previous DVT and another had a history of pneumonia.

Six patients (5.5%) received the correct regimen according to their individual risk categories, and a further 44 (40.0%) received no treatment. Fifty-nine patients (54.1%) received inadequate prophylaxis for their individual risk score – the so-called undertreated group. No patient received excessive prophylaxis.

Of the 59 patients who were regarded as inadequately treated, 44 (74.6%) received an incorrect dose and all of them were treated for a shorter than recommended duration.

All 3 patients (100%) in the low-risk category received the correct prophylaxis. In the moderate-risk group, two patients (13.3%) received the correct prophylaxis

but 13 (86.6%) received no prophylaxis at all. In the high-risk group, 19 (45.2%) patients received no prophylaxis and 23 (54.8%) received inadequate prophylaxis, while in the highest-risk group 12 (24.5%) received no prophylaxis and 37 (75.5%) received some, but inadequate, prophylaxis.

Three of the 21 treating doctors (14.3%) indicated that they regularly used a scoring system for preoperative risk assessment. The rest based their decisions on general medical knowledge, departmental protocol, index of suspicion or recent literature. These claims are in contrast to the observation that 11 doctors (52.4%) prescribed the same routine prophylaxis regimen to their patients. Only 10 doctors (47.6%) prescribed different regimens of prophylaxis adjusted for risk levels.

Discussion

The average patient undergoing gynaecological surgery at Kalafong Provincial Tertiary Hospital is at highest risk for developing perioperative VTE. This is mainly attributable to their body mass index (BMI), age and the type of surgery. Surgery is considered high risk if the length of the general anaesthesia exceeds 45 minutes, if malignancy is present, if major surgery is performed to pelvic organs, and if there is prolonged postoperative immobilisation or bed rest. The most frequent risk factor for coagulopathy in this study was the use of combined oral contraceptives and hormone therapy. Only one patient had a history of previous DVT. The most frequent risk factor for a bleeding tendency was the use of NSAIDs, with only 1.8% of patients taking low-dose aspirin for cardiovascular protection.

The audit of VTE prophylaxis revealed that the group at relatively high risk for VTE was mostly inadequately treated, with undertreatment the most common reason. Only 5% of the study population was managed correctly. This may be a result of not individualising prophylaxis for patients by utilising a risk-factor profile. There was a tendency to prescribe prophylaxis with a 'one-size-fits-all' approach. The risk category most likely to be correctly treated is the low-risk group, who in this study had been correctly identified as not needing prophylaxis. Eighty-seven per cent of patients in the moderate-risk group received no prophylaxis, which perhaps

demonstrates a perceived lack of risk factors. The risk category most likely to be undertreated is the very high-risk group (76%); all of the patients received prophylaxis either at the wrong dosage interval, or not for the correct period of time. This observation begs the question whether risk in this group of patients is truly underestimated, or awareness of the current recommendations is simply lacking.

Patients undergoing gynaecological oncology surgery derive less protection from twice-daily dosing of low-dose unfractionated heparin (LDUH) compared with those with benign disease, and require thrice-daily dosing or a low-molecular-weight heparin (LMWH).[11] However, four randomised controlled trials have shown that LDUH given in the correct dose (administered 8-hourly) is not inferior to an LMWH in terms of efficacy and safety as far as oncology patients are concerned.[11] A significant number of these patients received suboptimal dosages of LDUH. Another regimen supported by the ACCP is combined prophylaxis, i.e. the combined use of a pharmacological and a mechanical agent. The unavailability of mechanical prophylaxis such as intermittent pneumatic compression devices and graduated compression stockings at the hospital may also contribute to the high figures of undertreatment demonstrated in this study.

Current ACCP guidelines advise prolonged VTE use (2 - 4 weeks) in oncology surgery, in patients older than 60 and in those with a prior history of VTE.[11] No patients in the study who required prolonged VTE prophylaxis received it. The vast majority of undertreated patients were in the highest-risk category, and they did not receive prophylaxis for the minimum period of 7 days. Prophylaxis in this group was given only until discharge. Prophylaxis until discharge is only suitable for patients in the moderate-risk group.

The study population was not followed up to determine whether the inadequate VTE prophylaxis prescribed had any clinical significance. The results are based on the data collected at a single hospital in one discipline and may therefore not be readily generalised to other institutions or disciplines.

Conclusion

The majority of patients undergoing gynaecological surgery are at the highest risk for VTE-related morbidity. This risk is estimated to be as high as 40 - 80%, with a 0.2 - 5% PE fatality rate. It is essential that every gynaecological unit has a formal risk assessment model to objectively categorise patients in risk categories preoperatively. VTE prophylaxis guidelines should be readily available in an attempt to ensure that patients receive adequate and optimal VTE prophylaxis based on their risk profiles. High-risk and very high-risk patients should be discharged on prophylactic treatment. The appropriate and adequate prescription of VTE prophylaxis should be a major consideration for every modern-day surgeon, and it is a practice that was demonstrated to be lacking in this study as well as in other published literature.

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